

Consanguinity and Common Adult Diseases in Israeli Arab Communities

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Consanguinity has a deleterious effect with regard to congenital malformation and rare autosomal recessive diseases; however, little information exists on its role in multifactorial common adult morbidity.

We investigated the effects of consanguinity on the prevalence of common diseases in adulthood, including diabetes mellitus, myocardial infarction, bronchial asthma, and duodenal ulcer. As part of a larger study investigating the inbreeding coefficient in the Israeli-Arab community, we distributed questionnaires to parents of 4,100 second-grade students in 158 randomly chosen schools. Among the 3,772 responders (92%), 34.8% of the students' fathers and 31% of their mothers were found to be born to consanguineous matings. There was no difference in the prevalence (males, females) between the offspring of consanguineous versus non-consanguineous matings for diabetes mellitus (consanguinity: 4.3%, 1.5% vs. non-consanguinity: 2.9%, 1.6%) myocardial infarction (2.7%, 0.03% vs. 2.3%, 0.03%), bronchial asthma (2.4%, 2.0% vs. 3.7%, 2.3%), or duodenal ulcer (7.0%, 3.0% vs. 7.8%, 2.9%), respectively. The study suggests that even in a population with a high rate of consanguinity, there is no significant increase in the prevalence of these common adult diseases. *Am. J. Med. Genet.* 70:346–348, 1997.

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INTRODUCTION

Intermarriage is practiced in many countries and is often associated with deleterious health effects caused by the expression of rare recessive genes inherited from a common ancestor or ancestors [Al-Awadi et al., 1985, Badr, 1972; Fraser and Biddle, 1976; Jaber et al., 1992]. Studies have shown that 20 to 50% of all marriages in Islamic countries are consanguineous. The frequency of consanguineous marriages in the Arab population in Israel and the rate of major congenital malformations in offspring of first cousins were recently found to be extremely high, at 45 and 15.8%, respectively [Jaber et al., 1992, 1994].

Little information is available on the possible role of consanguinity and recessive genes in multifactorial or polygenic common adult diseases. The present study was conducted to determine whether consanguinity has an effect on the prevalence of such common diseases in adulthood as diabetes mellitus, myocardial infarction, bronchial asthma, and duodenal ulcer.

MATERIALS AND METHODS

This study was part of a previously described investigation of the consanguinity rate among the Israeli Arab population in Israel [Jaber et al., 1994]. With the permission of the Israel Ministry of Education, all fathers of 9,300 second-grade students attending 158 randomly chosen schools in 69 Arab villages and towns were interviewed using a simple questionnaire in Arabic. The questionnaire consisted of two parts. The first included demographic items and presented 13 types of biological relationships from which the respondent was to choose the one that described the relationship between him and his wife, between his own parents, and between his wife's parents. Information was also collected regarding the education and socioeconomic status of the family. Socioeconomic status was defined according to the family property and yearly income, and was classified as high, average, or low [Jaber et al., 1992]. It was found previously that there is no significant difference between the parent relationship classes

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in the distribution of number of offspring or socioeconomic status of the studied families [Jaber et al., 1992]. The second part of the questionnaire which was given to the fathers of 4,100 of the students, randomly chosen from among the original group, dealt with the presence of the following common diseases: myocardial infarction; bronchial asthma; diabetes mellitus; and duodenal ulcers. Data collected included age at onset of the disease(s) and disease severity.

To ensure the cooperation of the subjects, one of us (L.J.) spoke with each school principal to stress the importance of the study and to answer any questions. In addition, both the authors and the Ministry of Education mailed notices to the schools about the study. To determine the quality of the answers, 123 randomly chosen participants were interviewed by phone two months after the return of the questionnaire; 115 were reached, and their verbal information was identical to the written data submitted previously.

The inbreeding coefficient (IC) was calculated as described in a previous publication [Jaber et al., 1994].

RESULTS

Of the 4,100 questionnaires distributed, 3,772 were returned, for a response rate of 92%. Some members of both the consanguineous and nonconsanguineous groups failed to answer one or more of the questions with a rate of 5.0% for different items. Mean age of the fathers and mothers was 24 and 19 years at marriage and 37 and 33 years at the time of the survey, respectively, similar to the findings during the screening of the general population [Jaber et al., 1994]. Of the total matings of the parents of the respondents, 34.8% were consanguineous on the fathers' side and 31% on their wives' side. The frequency of myocardial infarction, bronchial asthma, diabetes mellitus, and duodenal ulcers in the respondents and their wives (i.e., the offspring of the consanguineous and nonconsanguineous matings) are depicted in Tables I and II. Diabetes mellitus and myocardial infarction were slightly more com-

mon in males born of consanguineous matings (4.3% and 2.7%, respectively) than in males born of nonconsanguineous matings (2.9% and 2.3%, respectively), but the differences did not reach statistical significance ($P = 0.17$). Analysis according to severity (Tables I and II) showed a similar distribution of mild-moderate and severe cases of diabetes mellitus and myocardial infarction in both the consanguineous and nonconsanguineous groups. Similarly, there was no significant difference between these groups in age at onset of the diseases.

DISCUSSION

Consanguineous marriages are generally associated with an increased incidence of genetic diseases [Schull, 1958; Naderi, 1979; Harper, 1984; Gatrad et al., 1984; Magnus et al., 1985], poor growth [Honeyman et al., 1987], and infant mortality [Fraser and Biddle, 1976; Magnus et al., 1985; Shami et al., 1989]. More specifically, we recently demonstrated a markedly high rate of consanguineous matings among Israeli Arab communities which was associated with a distinct increase in major malformations among offspring of first-cousin matings (15.8%) compared to unrelated matings (5.8%) [Jaber et al., 1992]. In the present study we investigated the effects of such high consanguinity in this population on the prevalence of four common adult diseases: myocardial infarction, bronchial asthma, diabetes mellitus, and duodenal ulcers. The study showed no significant increase in the prevalence of any of these diseases in the offspring of consanguineous matings. Moreover, the overall prevalence of these diseases among Israeli Arabs was not higher than in the Israeli Jewish population, despite the fact that Israeli Arabs are considered an inbred population with a common gene pool.

Each Arab village was originally founded by 8–20 families [Jaber et al., 1992], and marriages today continue to be conducted between members of the same village; only 15% of all marriages occur between mem-

TABLE I. Prevalence of Common Diseases Among Male Offspring of Consanguineous vs. Nonconsanguineous Matings

| | Consanguineous | Nonconsanguineous | $P <$ |
|------------------------------|----------------|-------------------|-------|
| Diabetes mellitus | | | |
| No. of subjects ^a | 1,285 | 2,438 | |
| Mild | 10 | 10 | |
| Moderate | 31 | 42 | |
| Severe | 15 | 20 | |
| Total affected (%) | 56 (4.3) | 72 (2.9) | 0.17 |
| Myocardial infarction | | | |
| No. of subjects ^a | 1,308 | 2,451 | |
| Mild | 12 | 20 | |
| Moderate | 9 | 11 | |
| Severe | 8 | 25 | |
| Total affected (%) | 29 (2.7) | 56 (2.3) | 0.45 |
| Bronchial asthma | | | |
| No. of subjects ^a | 1,310 | 2,414 | |
| Total affected (%) | 32 (2.4) | 93 (3.7) | 0.02 |
| Duodenal ulcer | | | |
| No. of subjects (%) | 1,250 | 2,302 | |
| Total affected (%) | 94 (7.0) | 194 (7.8) | 0.38 |

^aNumber of individuals who responded to questionnaire.

TABLE II. Prevalence of Common Diseases Among Female Offspring of Consanguineous vs. Nonconsanguineous Marriages

| | Consanguineous | Nonconsanguineous | <i>P</i> < |
|------------------------------|----------------|-------------------|------------|
| Diabetes mellitus | | | |
| No. of subjects ^a | 1,131 | 2,491 | |
| Mild | 1 | 8 | |
| Moderate | 9 | 22 | |
| Severe | 7 | 11 | |
| Total affected (%) | 17 (1.5) | 41 (1.6) | 0.52 |
| Myocardial infarction | | | |
| No. of subjects ^a | 1,143 | 2,523 | |
| Mild | 1 | 4 | |
| Moderate | 1 | 1 | |
| Severe | 2 | 3 | |
| Total affected (%) | 4 (0.03) | 8 (0.03) | 0.84 |
| Bronchial asthma | | | |
| No. of subjects ^a | 1,122 | 2,467 | |
| Total affected (%) | 23 (2.0) | 57 (2.3) | 0.63 |
| Duodenal ulcer | | | |
| No. of subjects (%) | 1,116 | 2,453 | |
| Total affected (%) | 35 (3.0) | 72 (2.9) | 0.75 |

^aNumber of individuals who responded to questionnaire.

bers of different villages. It is possible that a greater number of studies of individuals are required to demonstrate an increase in the prevalence of a disease that is determined by several loci among offspring of consanguineous families. In addition, some of the reports may have been incomplete with regard to disease. However, since the parents were not aware that we were comparing consanguineous and nonconsanguineous matings, and consanguineous marriages are a matter of custom in this society, there is little likelihood of errors of omission in the questionnaires in this area in one groups vs. the other. Our findings suggest that many of the genes involved in the diseases studied function in the hemizygous state.

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